IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant	:	Hampapur, et al.	) Group Art Unit 2713
Appl. No.	:	08/870,836	)
Filed	:	June 6, 1997	)
For	:	KEY FRAME SELECTION	)
Examiner	:	Anand Rao	)

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February 14, 2000
(Date)

John M. Carson, Reg. No. 34,303

AMENDMENT

Assistant Commissioner for Patents
Washington, D.C. 20231

Dear Sir:

In response to the final Office Action dated October 13, 1999 (Paper No. 7) in the above-referenced patent application, please make the following amendments:

IN THE CLAIMS:

Please amend Claims 1, 8 and 18:

1. (Twice Amended) A computerized method of extracting a key frame from a video, comprising:

a) providing a reference frame;

b) providing a current frame different from the reference frame;

c) determining a chromatic difference measure between the reference frame and the current frame;

d) determining a structure difference measure between the reference frame and the current frame based, at least in part, on edges identified in each of the frames; and

e) identifying the current frame as a key frame if the chromatic difference measure exceeds a chromatic threshold and the structure difference measure exceeds a structure threshold.

8. (Twice Amended) A computerized method of extracting a key frame from a video having a plurality of frames, the method comprising:

a) providing a reference frame;

b) providing a current frame different from the reference frame;

c) determining a first difference measure between the reference frame and the current frame;

d) determining a second difference measure between the reference frame and the current frame <u>based, at least in part, on edges identified in each of the frames</u>; and

e) identifying the current frame as a key frame if the first difference measure exceeds a first threshold and the second difference measure exceeds a second threshold.

18. (Twice Amended) A computerized method of extracting a key frame from a video having a plurality of frames, the method comprising:

a) providing a reference frame;

b) providing a current frame different from the reference frame;

c) determining a structure difference measure between the reference frame and the current frame <u>based, at least in part, on edges identified in each of the frames</u>; and

d) identifying the current frame as a key frame if the structure difference measure exceeds a structure threshold.

Please add new Claim 23:

23. A computerized method of extracting a key frame from a video having a sequence of frames, the method comprising:

a) providing a reference frame;

b) providing a current frame different from the reference frame;

c) determining a chromatic difference measure between the reference frame and the current frame;

d) determining a structure difference measure between the reference frame and the current frame; and

e) identifying the current frame as a key frame if the chromatic difference measure exceeds a chromatic threshold and the structure difference measure exceeds a structure threshold, without accumulating differences between pairs of frames of the video sequence.

REMARKS

Applicant amends Claims 1, 8 and 18, and adds new Claim 23 by this paper. Claims 2-7, 9-17, and 19-22 remain unchanged and are also presented for examination. Reconsideration and allowance of all Claims 1-23 in light of the present remarks is respectfully requested.

Interview

Applicant's representative wishes to thank Examiner Anand Rao for the personal interview conducted on January 14, 2000. During the personal interview, as noted on the Interview Summary form, Examiner Rao stated that "the proposed limitations of 'a structural difference measure based on identified edges...' as in claims 1, 8, 18 and proposed claim 23 which discloses the using 'non-accumulated differences...' overcomes the art of record, and would place the application in a favorable condition for allowance if submitted as a formal response after final".

Discussion of the Claim Rejection under 35 U.S.C. § 102(e)

Claims 1-22 were rejected under 35 U.S.C. § 102(e) as being anticipated by Zhang et al. ("Zhang"), U.S. Patent No. 5,635,982.

Figures 4 and 4A depict the keyframe extraction method of Zhang. The state after state 504 (not labeled) through state 509 are not performed by Applicant. Applicant's claimed invention does not accumulate the differences between consecutive frames, as performed by Zhang at state 506, and the accumulated differences are not compared to a threshold, as

performed at the state between states 506 and 509. States 510 and 511 are performed by Zhang for one difference metric and one threshold.

In contrast, in certain aspects of Applicant's claimed invention, a first difference measure and a second difference measure are both determined individually between the previous keyframe and each successive frame. In one embodiment, the second difference measure is orthogonal to the first difference measure. Each of the results is compared to a corresponding first threshold and second threshold. If both thresholds are exceeded, the current frame is identified as a keyframe. In one embodiment of Applicant's invention, the second difference measure is a structure difference measure that is based, at least in part, on edges identified in each of the frames. Some of the claims include the limitation: "determining a structure difference measure between the reference frame and the current frame based, at least in part, on edges identified in each of the frames". Structural difference measurements are described at pages 13-21 of the specification.

Since Zhang does not describe use of a structural difference measure including those based on identified edges or any equivalent metric, Applicant submits that Zhang is overcome as a reference for Claims 1, 8 and 18. Since Claims 2-7, 9-17 and 19-22 are dependent on independent Claims 1, 8 and 18, respectively, pursuant to 35 U.S.C. § 112, ¶4, they incorporate by reference all the limitations of the claim to which they refer. Therefore, the rejection of the dependent Claims 2-7, 9-17 and 19-22 has also been overcome. Therefore, in view of the above, it is submitted that Claims 1-22 are clearly distinguished from the cited art and are patentable.

New Claim

New independent Claim 23 has been added by Applicant to further define the invention. Claim 23 is supported by Figure 5 and the corresponding text in the specification. In these aspects of Applicant's claimed invention, the differences between consecutive frames are not accumulated, as performed by Zhang, and/or the accumulated differences are not compared to a threshold, as also performed by Zhang. Claim 23 is, therefore, also deemed patentable.

Conclusion

By this amendment, Applicant has amended the claims. In view of the discussion during the personal interview and the foregoing amendments and remarks, Applicant respectfully submits

that Claims 1-23 of the above-identified application are in condition for allowance. However, if the Examiner finds any further impediment to allowing all claims that can be resolved by telephone, the Examiner is respectfully requested to call the undersigned.

Respectfully submitted,

KNOBBE, MARTENS, OLSON & BEAR, LLP

Dated: 2/14/00

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